Journal of the Operational Research Society (2017)

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Do managerial skills matter? An analysis of the impact of managerial features on performance for Italian football

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This paper studies the impact of a set of managerial characteristics on performance in the top division (Serie A) of the Italian football league during seasons 2000/2001–2009/2010. We employ a bivariate ordered probit model applied to match-level data, which allows for asymmetric effects at home and away matches and in goals scored and conceded. Our set of coach characteristics includes indicators of skill, experience, innate features as well as empathy with the team. We find that some managerial features matter even when we control for club power and past results. Performance is positively correlated with the manager having had experience abroad and with the manager being a former player with the club; but performance is worsened by lack of managerial experience. Other features affect only some particular aspects of performance. In particular, Italian managers are more defensive in home games while older managers are more defensive in away games. Our approach also identifies a negative effect of managerial turnover on defensive performance, an effect which is masked when a more traditional aggregated model is used.

Journal of the Operational Research Society (2017). doi:10.1057/s41274-017-0215-6

Keywords: leadership; bi-ordered probit model; coach dismissals; endogeneity

JEL Classification: J24; M51; C25; C35; L83; M11

1. Introduction

Sports managers are often identified as a key element in explaining team performance. This is corroborated by a number of recent research papers that use sports data to estimate the impact of different manager characteristics on performance; see, for example, Bridgewater *et al* (2011), Hofler and Payne (2006) and Kahane (2005) for analysis of British football, the NBA and the NHL, respectively. They find support for the hypothesis that some manager characteristics such as experience, past success and empathy play an important role to explain in explaining team results.

In this paper, we contribute to this ongoing debate by analysing the causal effect of manager characteristics on match results in the top division (Serie A) of the Italian football league during seasons 2000/2001–2009/2010. The estimation is implemented by a bivariate ordered probit model in which we allow the different features of home and away managers to have a different impact on the two equations in the model, which account for defensive and attacking performance, respectively.

The use of this econometric framework has at least two important advantages when applied to the estimation of the causal impact of managerial features on performance in football and other contexts. First, it seems plausible to think that the type of manager chosen by a firm is not exogenous to the expected result of the organization, which could result in potential biased estimations when both managers and results are observed simultaneously. Here this problem is circumvented by considering match-level data instead of team season or yearly observations in the case of sport and conventional firms, respectively. The use of high-frequency data not only allows for a more precise estimation of the causal impact but, more importantly, allows the potential simultaneity problem to be addressed because manager characteristics can be considered as exogenous to the result in a particular match after controlling for club status and previous results.

A second important contribution of the paper relates to the disaggregation of different output measures in the organization. More specifically, the proposed specification allows us to

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explore the impact of different coach characteristics on different aspects of performance by distinguishing between results at home and away and goals scored and conceded. This is highly relevant as the difference between home and away results allows us to understand how the several managerial characteristics have their effect on overall performance. Moreover, the distinction between goals scored and conceded allows us to determine the relevance of managerial characteristics in two different aspects of the game that require different abilities. While defence is typically related to physical training and concentration, attack requires more skill and inspiration. To our knowledge, this is the first attempt to analyse how the importance of managerial characteristics is affected by the external environment and the degree of skill required for a given task.

To preview, we find that manager experience and having played for the club are important variables to explain team performance in attack and defence, respectively. This is consistent with the view that experience is helpful to stimulate more creative skills while empathy with the institution has a more direct effect on players' attitudes in defence. Nationality and age also matter for improving defensive skills while other variables related, for example, to the position where the manager used to play or his having been active in the previous year are irrelevant.

Using the proposed specification, we also study the impact of managerial turnover on performance. Our estimation results clearly indicate that replacing a coach has a negative impact on the defensive skill of the team in away matches. However, this negative effect is masked when a more traditional econometric model is used.

This paper is organized as follows. The next section relates our work to the previous literature. In Section 3, we describe data on managerial characteristics employed in our empirical work and draw inferences from them regarding typical circumstances in which dismissals occur in Italy. In Section 4, we present the estimation of the impact of managerial characteristics on aggregate performance in the Italian league. Then, in Section 5 we disaggregate the previous analysis by estimating the impact of managerial characteristics on goals scored and conceded in home and away matches. Conclusions are drawn in Section 6.

2. Related literature

Recent years have witnessed an increasing interest in analysing the impact of managers' characteristics on firm performance; see, for example, Kaplan *et al* (2012) and Bloom and Van Reenen (2007).

Although it is generally accepted that managers are key inputs in understanding the firm's production function, most of the existing research aims to identify the set of managerial features that is relevant to augment production output. They include a broad range of characteristics such as the monitoring role, resoluteness, persuasiveness and empathy and team-related skills.

Early work by Mintzerg (1973) identifies the monitoring role as one of the key characteristics shared by successful managers. Bridgewater *et al* (2011) pinpoint that successful managers should be able to play both a teaching role, which is mostly related to his/her ability, and a credibility role to convince employees to submerge their egos in the interest of the firm. They argue that credibility can be achieved by, for example, reputation and/or expertise. Using information from British football, they show that these roles are highly institutional dependent. In particular, the teaching role becomes more relevant for lower-division teams while managerial experience is especially important to raise the productivity of top players. The importance of managerial experience has also been highlighted in other publications related to the sport industry; see Goodall *et al* (2011) and Hofler and Payne (2006). Others, like Dawson and Dobson (2002), emphasize the importance of empathy and team-related skills, finding for British football that the performance of a club is raised by being managed by one of its former players.

Bolton *et al* (2013) develop a theoretical model that compares the importance of managerial resoluteness against communication and listening skills. They conclude that resoluteness and overconfidence are managerial characteristics more related to performance than empathy and team-related skills. However, evidence about this result is mixed in the literature. For example, Heaton (2002) finds that overconfidence is a negative managerial feature that could result in bad investment decisions. Results in Gervais *et al* (2011) are consistent with the view that moderate levels of overconfidence can increase the value of the firms by mitigating moral hazard and aligning incentives. Malmendier and Tate (2005) find that overconfident managers are more likely to generate value-destroying mergers as they show higher investment-cash flow sensitivity.

This paper builds on previous research by studying the impact of different managerial characteristics on performance. However, unlike previous research and as explained in the previous section, the consideration of a bivariate ordered probit model applied to match-level data in the top division of the Italian football league allows us to deal with potential simultaneity problems and to estimate how the impact of coaches is conditional to the degree of external pressure and the type of activity the team undertakes.

Further, the paper considers a comprehensive set of managerial characteristics considered in the earlier literature and estimates the importance of each for firm performance in the context of football.

3. Data analysis

The data relate to the top Italian football league (Serie A) in the time span 2000/2001–2009/2010. For the period from 2000/2001 to 2003/2004, 18 clubs participated in Serie A and there were 20 teams during 2005–2010. We collected data for

Table 1 Descriptive statistics of managers' characteristics

Variable	*Obs*	*Mean*	*SD*	*Min*	*Max*
Italian	304	0.94	0.24	0	1
Deputy manager	304	0.05	0.22	0	1
First experience as coach	304	0.11	0.31	0	1
Ex-football player	304	0.85	0.35	0	1
Home-club ex-football player	304	0.20	0.40	0	1
Last home-club ex-football player	304	0.07	0.25	0	1
Ex-football player (goalkeeper)	304	0.03	0.18	0	1
Ex-football player (defender)	304	0.25	0.43	0	1
Ex-football player (midfield)	304	0.53	0.50	0	1
Ex-football player (striker)	304	0.06	0.24	0	1
Experience abroad	304	0.14	0.35	0	1
Activity previous year	304	0.77	0.42	0	1
Age	304	50.52	6.89	36	69

With the only exception of age that is measured in years, all remaining variables are categorical and take only values 0 and 1.

3504 matches; for each match, our dataset contains the date of the match, the final result, the name of the home and away team coaches and their individual characteristics. All data come from the official website of *Lega-Calcio*, which organized the two highest football leagues in Italy, namely Serie A and Serie B, from 1946 to 2010. During the period of analysis, Internazionale, Lazio, Milan, Roma and Udinese played in Serie A in all ten seasons, while Ancona, Como, Treviso, Venezia and Vicenza participated in only one season.

According to the previous section, information about club managers can be split into sets of characteristics that are relevant according to the existing literature: experience, empathy with the club, ability to teach and resoluteness. However, it must be emphasized that the classification of the different observed features is not mutually exclusive, and indeed, some features belong to more than one group. Table 1 presents some descriptive statistics for manager characteristics.

As proxies for empathy with the club, we collected information about the nationality of the coach, whether he had been a player for the same club and whether he had previously been an assistant manager with the club. These variables could have a positive impact on team performance through two channels. First, a manager can take advantage of his knowledge of the club because he already knows its environment and, probably, its staff. Second, if a manager is already known by the supporters, due to share the same nationality or past footballer experience, he can have more support increasing the chance of success.

The second set of individual characteristics refers to manager experience. More specifically, we collected information about whether he had had experience abroad, if this was his first season as a coach and his age. Manager experience is important to deal with the egos of professional footballers and convince them to put their effort in favour of the team.

Then, we collected information related to the role the manager had filled during his career as a player (goalkeeper, defender, midfielder and striker). The intuition is that this is very related to the skills he learned as a player and therefore to his teaching role.

Finally, we also consider whether the manager had been active during the previous year. Not having been a coach in the last year could have an effect on a manager's current knowledge or self-confidence, although, in principle, it is not particularly important in terms of overall experience.

Table 2 shows all the manager dismissals in Serie A during 2000–2010. The total number of involuntary removals is 95, with an average of 9.5 events per year. Interestingly, we can observe that poor results are the most frequent causes of manager dismissal (about 89% of cases). All information comes from the official sources of Italian clubs and, as is always the case in such analysis, the real motivation for a dismissal can be grasped from public statistics as well as by using fans club blogs and fanzines. Poor performance of a club is very often the product of a poor relation between staff, manager and players. Furthermore, management disagreements may remain latent until a "shock" (a severe defeat, elimination from major competitions, fans objections, etc.) that officially drives to the manager removal. In this sense, it is not observable the real motivation that leads to the change of the coach. Besides, the ranking obtained at the moment of the dismissal is worse than the one in the previous season, giving some motivation of such decision (on average, about four positions down). Furthermore, dismissal coaches exhibit bad results in the last match (mean points equal to 0.44, and the score difference is −1.08) and in the last four games (0.61 points).

4. Match results model

We estimate an ordered probit model to account for the determination of First Division (Serie A) match results in the Italian league, employing data from games from season 2000/2001 to 2009/2010. The first four rounds of matches

Table 2 Manager dismissals statistics

Variable	*Obs*	*Mean*	*SD*	*Min*	*Max*
Quarrel	95	0.02	0.14	0	1
Supporters disagreement	95	0.02	0.14	0	1
Management disagreement	95	0.04	0.20	0	1
Poor results	95	0.89	0.31	0	1
Actual ranking	95	15.44	4.39	2	20
Ranking 1 year before	75	10.72	4.83	1	20
Difference in actual ranking w.r.t. 1 year before	75	4.11	4.88	−12	18
Serie B (previous year)	95	0.17	0.39	0	1
Last result (points)	95	0.44	0.80	0	3
Last score difference	95	−1.08	1.15	−4	2
Last four results (points)	95	0.61	0.45	0	1.75

each season were excluded from the sample because results on teams' previous matches at home and away were used as regressors. A total of 3303 matches remain to be included in the analysis. This is a very large and homogeneous data set that avoids some of the structural changes that potentially can have an impact on the dynamic evolution team performance such as the introduction of the European Champions league in 1992 and the Bosman ruling in 1996; see Flores *et al* (2012).

In order to analyse the impact of managerial features on results, we adopt the following specification:

$$\begin{aligned} y_i^* = {} & \alpha_1 whh_i + \alpha_2 wha_i + \alpha_3 dhh_i + \alpha_4 dha_i + \alpha_5 wah_i \\ & + \alpha_6 waa_i + \alpha_7 wah_i + \alpha_8 waa_i \\ & + \pi_1 m10\_h + \pi_2 m10\_a + \beta' x + e_i \end{aligned} \tag{1}$$

where e_i is a normal error term for the ith match and the dependent variable, y_i^* is defined such that

$$y_i = 0 \quad \text{if} \quad y_i^* \leq \delta_1 \tag{2}$$

$$y_i = 1 \quad \text{if} \quad \delta_1 < y_i^* \leq \delta_2 \tag{3}$$

$$y_i = 2 \quad \text{if} \quad y_i^* > \delta_2 \tag{4}$$

The values 0, 1 and 2 indicate whether the home team lost, drew or won the ith match. The variables whh_i, wha_i, dhh_i, dha_i, wah_i,waa_i, dah_i,daa_i are dichotomous dummies that refer to results immediately preceding the ith match. Specifically, whh_i and wha_i take a value of one if the home team won its previous home match and its last away match, before match i, respectively. ah_i and aa_i are defined similarly for the away team. They have value zero otherwise. Variables dhh_i, dha_i, dah_i and daa_i are defined in the same way for a draw in the previous match. These variables account for momentum in results and reversion to mean effects. $m10\_h$ and $m10\_a$ are the average number of points in the previous ten matches for the home and away teams in that season. In case these previous ten matches have not been played yet, these two variables are substituted by the average number of points in all the previous home and away matches played up to that moment. We consider that these variables can be interpreted both as strength index variables (for the home and away team) and also as an indicator for the current status of the team. However, we will test the robustness of our results to alternative measures of power.

Our focus is on x that is a vector including managerial features defined in the previous section: experience abroad active, age, age squared,[1] keeper, defender, midfielder, striker, first experience, previous team player, Italian, previous player, previous vice manager and whether he has replaced a previous coach within the season. In principle, for simplicity we impose the symmetry assumption between the home and away manager effect by defining these variables in differences. Hence, if they take value 1 (−1), it means that the feature is present only in the home (away) manager while if their value is zero it indicates that both managers have an identical value for that feature. This may seems a restrictive assumption and can be criticized on the grounds that the previous literature suggests that supporters may significantly influence the impact of home manage features on results; see Tena and Forrest (2007) and Flores *et al* (2012). However, this restriction will be relaxed in the following section.

Also note that specification (1) is comparable to previous authors who analyse the impact of managerial change, such as Audas *et al* (2002), Tena and Forrest (2007) and Flores *et al* (2012), in the sense that it also allows the estimation of the impact of the new manager on match results in the long run. However, an advantage of the specification here is its simplicity and also that it allows us to control for other managerial features that could potentially be correlated with expected results. Indeed, including these variables in the specification is a way to cope with the potential endogeneity of manager dismissals as this decision is likely correlated with the features of the managers.

We include indicators for past results only if they were significant at the 5% level. This leaves only one past result

[1]Age and Age^2 are included in order to take into account nonlinear effects. The rationale is that growing older has a positive impact on his team's results. But, at some point in time any further increase in the age may lead to a reduction in ability and performance. However, dropping the square term we obtain the same results.

Table 3 Random effects ordered probit regression: (a) estimated parameters and (b) marginal effects on match results evaluated at averaged values

	(a)			*(b) On home win*			*(b) On draw*		
	Coef.	*Se*	|z|	*dy/dx*	*Se*	|z|	*dy/dx*	*Se*	|z|
Home team won its last away match	0.095	0.043	2.21	0.035	0.015	2.21	−0.007	0.003	2.18
Home team average points in the last ten matches	0.390	0.039	9.89	0.144	0.014	10.29	−0.030	0.003	9.10
Away team average points in the last ten matches	−0.393	0.038	10.25	−0.145	0.013	10.69	0.030	0.003	9.08
Experience abroad	0.092	0.045	2.04	0.034	0.016	2.04	−0.007	0.003	2.02
Active	0.028	0.047	0.61	0.010	0.017	0.61	−0.002	0.003	0.61
Age	−0.003	0.002	1.27	−0.001	0.000	1.27	0.000	0.000	1.27
Age^2	0.000	0.000	1.28	0.000	0.000	1.28	−0.000	0.000	1.27
Keeper	0.030	0.131	0.23	0.011	0.048	0.23	−0.002	0.010	0.23
Defender	−0.039	0.105	0.37	−0.014	0.039	0.37	0.003	0.008	0.37
Midfielder	−0.042	0.100	0.42	−0.015	0.037	0.42	0.003	0.007	0.42
Striker	0.031	0.120	0.26	0.011	0.044	0.26	−0.002	0.009	0.26
First experience	−0.245	0.067	3.65	−0.090	0.024	3.67	0.019	0.005	3.60
Previous team player	0.115	0.040	2.83	0.042	0.015	2.84	−0.009	0.003	2.79
Italian	−0.109	0.074	1.48	−0.040	0.027	1.48	0.008	0.005	1.48
Previous player	0.146	0.086	1.69	0.053	0.031	1.69	−0.011	0.006	1.69
Previous deputy manager	−0.131	0.104	1.25	−0.048	0.038	1.25	0.010	0.008	1.25
Managerial change	−0.068	0.039	1.73	−0.025	0.014	1.73	0.005	0.003	1.73
Wald Chi-Square (17)[a]	323.31 (p value = 0.00)								
σ_u^2	3.36e−32 (p value = 0.00)								
Number of observations	3303								

Notes the residuals are clustered at teams' pair level.

[a] Statistical test for the whole model specification.

indicator: "home team won its last away match". In addition, in order to allow for the fact that the error term in expression (1) is not homoscedastic, we consider random effects to account for the potential heterogeneity that depends on each of the home and away team pairs, 70 individual effects in total. We do not estimate fixed effects in the ordered probit model due to the well-known incidental parameter problem, which can cause difficulties if the manager variables fail to be exogenous. The solution of including past results would not be valid in this case if the same manager had been in place for the preceding ten matches, as well as for the current match. The past results variables are, therefore, likely to absorb some of the influence of the coach variables. This could potentially introduce downward bias in the estimated parameters. However, it is important to note that the correlation matrices between the variables in the model (see "Appendix") indicate that the correlation of manager features with past results is lower than 10% in all cases. Therefore, in principle, it seems unlikely that past results absorb the influence of the coach variables.

We present in Table 3 the estimated parameters and marginal effects from the ordered probit estimation for a home win and a draw. The fact that previous results of the home and away team exert no significant influence on the current result could be considered as puzzling at the first sight. The reason for this is that in the regression we are also controlling for the impact of the last ten matches. Indeed, if the two variables accounting for the influence of the last ten matches are dropped from the regression, the impact of previous results by the home team becomes significant and positive. Hence, average points in the last ten matches, intended to capture differences in power between "weak" and "strong" teams, have a strong predictive power in accounting for the pattern of results.

Coefficients on our focus variables are significant at the 5% level only for experience abroad, first experience and previous player with the club. Results are consistent with our expectations about the importance of experience and the manager's identification with fans, which could make him more prone to make a greater effort to increase team performance. Moreover, we can suppose that former club players have a lot of (formal and informal) information about their own club, probably collected during their previous, and they are able to use such knowledge to improve the results of the club. Therefore, the human capital of managers seems to play a role in explaining differences in a club's performance. Interestingly, an involuntary managerial change within the season has a negative but not significant impact on performance.

Although our indicators of team power are significant in the regression, there are, of course, alternative ways of generating a proxy for club strength. In a study focussing on the issue of competitive balance, Koning (2000) took a very direct approach. The covariates in his ordered probit match results model were dummy variables representing each club which

had taken part in the Netherlands Premier League. Here, as a robustness exercise, we re-estimate our model, but instead of including the two variables which capture information from the last ten matches we allow for individual effects for each club at home and away. This amounts to the inclusion of 70 new parameters to be estimated. This specification is not a parsimonious specification, and it restricts the power of each team to be similar across different seasons. In spite of this restriction, we could still find similar impacts for managers' characteristics and we can also conclude that a new manager exerts a negative but not significant influence on results, and the impact on home win (draw) is −0.025 (0.005) with z-statistics 1.73 (1.73).

Regarding the impact of a managerial turnover, it is also relevant to compare our results with a recent paper by De Paola and Scoppa (2012) also for the Italian league. These authors present a highly very insightful and interesting discussion about the potential endogeneity problem and its influence on the analysis of managerial replacements. They argue that apart from the endogeneity problem due to mean reversion that can be controlled by using lagged match results, there is some remaining endogeneity that derives from the fact that coaches are not fired randomly throughout the season and that may depend on the perceived improvement that may emerge. They focused on this form of endogeneity and addressed it by employing an instrument that is correlated with the decision of firing a coach but uncorrelated with the error term of the model. They argued that the variable "remaining matches" in that season fulfils these two properties of a valid instrument. Although this variable is an interesting way to deal with this problem, note that we use a more extended sample and, at least for our dataset, the probability of dismissal is uncorrelated with round. Figure 1 shows the distribution of dismissals by round, suggesting that their distribution is more or less uniform except at the very beginning and end of the season where the proportion of dismissals are particularly low. According to this result, it makes sense to treat the potential endogeneity problem as we do in Eq. (1) by including lagged results, to account for mean reversion, and features of the different managers that explain the probability of coach dismissals.

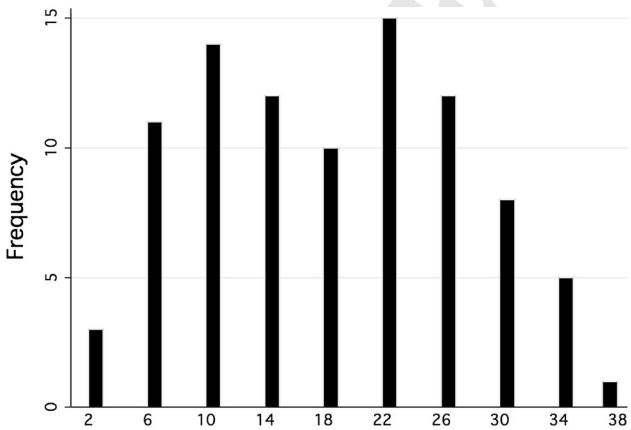

Figure 1 Average number of managerial dismissals by round. Seasons 2000/2001 to 2009/2010.

In spite of using different econometric specifications, our results are comparable with those in De Paola and Scoppa (2012): a managerial change has no impact on match results. Moreover, this result also holds when we restrict our sample to the five seasons considered by De Paola and Scoppa (2012), the estimated impact of a new manager on home victory (draw) is −0.021 (0.004) with associated z-statistic of −1.06 (1.06).

5. Extending the basic model

Model (1) in the previous section is based on two important restrictions about the impact of managers on results, namely (1) the impact of home and away managers is symmetric; (2) managers have a similar effect on goals scored and goals conceded. Relaxing these assumptions is important for understanding the reasons why the various managerial characteristics are important.

We adopt the following bivariate ordered probit model

$$g\_h^* = \gamma_{11} g\_hh_i + \gamma_{12} g\_ha_i + \pi_{11} m10_h + \pi_{21} m10_a + \beta_{11}' h\_x + \beta_{12}' a\_x + e_{1,i} \quad (5)$$

$$g\_a^* = \gamma_{21} g\_ah_i + \gamma_{22} g\_aa_i + \pi_{21} m10_h + \pi_{22} m10_a + \beta_{21}' h\_x + \beta_{22}' a\_x + e_{2,i} \quad (6)$$

where $e_{1,i}$ and $e_{2,i}$ are two normalized error terms that could be contemporaneously correlated, g_h^* and g_a^* are associated with the observed number of goals (0 for no goals, 1 for one goal and 2 for more than one goal) scored by the home (g_h) and away (g_a) teams, respectively, according to

$$g\_h = \begin{cases} 0 \text{ if } g\_h^* \le c_{11} \\ 1 \text{ if } c_{11} < g\_h^* \le c_{12} \\ 2 \text{ if } c_{13} < g\_h^* \end{cases} \quad g\_a = \begin{cases} 0 \text{ if } g\_a^* \le c_{21} \\ 1 \text{ if } c_{21} < g\_a^* \le c_{22} \\ 2 \text{ if } c_{23} < g\_a^* \end{cases} \quad (7)$$

Variables g_hh_i, g_ha_i,g_ah_i and g_aa_i are the number of goals scored and conceded by the home and away teams, respectively, in their previous matches; h_x and a_x include the same managerial features considered in model (1) from the previous section, but defined for the home and away managers, respectively. All these variables are dichotomous and take value 1 if the feature is present in the manager and 0 otherwise except for age that indicates the age of the manager in years.

Note that equations (5), (6) and (7) constitute a seemingly unrelated specification. The identification conditions as well as the estimation of such models is discussed by Sajaia (2008).

A well-known problem of multinomial probit models is that, as the number of dimensions increases, many standard

Table 4 Bivariate ordered probit regression: (a) estimated parameters and (b) marginal effects on home goals evaluated at averaged values

	(a) Estimated parameters			*(b) Home team scores two goals or more. Marginal effects.*			*(b) Home team scores no goals. Marginal effects.*		
	Coeff	*Se*	|z|	*dy/dx*	*Se*	|z|	*dy/dx*	*Se*	|z|
Goals scored by home team's last home match	0.015	0.027	0.58	0.006	0.010	0.58	−0.004	0.007	0.58
Goals scored by home team's last away match	0.053	0.026	2.01	0.021	0.010	2.00	−0.015	0.007	2.02
Home team average points in the last ten matches	0.292	0.040	7.18	0.115	0.016	6.90	−0.081	0.011	7.12
Away team average points in the last ten matches	−0.255	0.040	6.30	−0.101	0.016	6.28	0.071	0.011	6.22
Home experience abroad	0.081	0.061	1.33	0.032	0.024	1.34	−0.022	0.016	−1.36
Away experience abroad	0.031	0.063	0.50	0.012	0.025	0.50	−0.008	0.017	0.50
Home active	0.021	0.061	0.35	0.008	0.024	0.36	−0.006	0.016	0.35
Away active	0.020	0.059	0.34	0.008	0.023	0.34	−0.005	0.017	0.34
Home age	−0.014	0.044	0.32	−0.005	0.017	0.33	0.004	0.012	0.32
(Home age)^2	0.000	0.000	0.26	0.000	0.000	0.26	−0.000	0.000	0.26
Away age	−0.027	0.045	0.62	−0.001	0.017	0.62	0.007	0.012	0.62
(Away age)^2	0.000	0.000	0.57	0.000	0.000	0.58	−0.000	0.000	0.57
Home keeper	−0.026	0.199	0.13	−0.010	0.078	0.14	0.007	0.057	0.13
Away keeper	−0.160	0.189	0.85	−0.062	0.072	0.86	0.047	0.059	0.80
Home defender	−0.190	0.151	1.26	−0.074	0.058	1.26	0.055	0.046	1.21
Away defender	−0.137	0.161	0.85	−0.053	0.062	0.87	0.039	0.048	0.82
Home midfielder	−0.152	0.145	1.04	−0.060	0.057	1.05	0.042	0.039	1.06
Away midfielder	−0.209	0.153	1.37	−0.082	0.060	1.37	0.057	0.041	1.39
Home striker	−0.103	0.167	0.62	−0.040	0.065	0.61	0.029	0.050	0.59
Away striker	−0.240	0.179	1.34	−0.093	0.067	1.39	0.073	0.058	1.24
Home first experience	−0.286	0.087	3.27	−0.110	0.032	3.40	0.088	0.029	3.00
Away first experience	0.023	0.092	0.26	0.009	0.036	0.26	−0.006	0.025	0.26
Home previous team player	0.028	0.051	0.56	0.011	0.020	0.55	−0.007	0.014	0.56
Away previous team player	−0.115	0.050	2.29	−0.045	0.019	2.29	0.033	0.014	2.23
Home Italian	−0.231	0.101	2.29	−0.092	0.040	2.24	0.059	0.023	2.55
Away Italian	0.069	0.095	0.73	0.027	0.037	0.75	−0.020	0.028	0.72
Home previous player	0.200	0.134	1.49	0.078	0.051	1.52	−0.059	0.042	1.41
Away previous player	−0.000	0.145	0.00	−0.000	0.057	0.00	0.000	0.040	0.00
Home previous vice manager	0.031	0.130	0.24	0.012	0.051	0.23	−0.008	0.035	0.24
Away previous vice manager	0.213	0.142	1.45	0.085	0.058	1.52	−0.054	0.034	1.61
Home managerial change	−0.040	0.051	0.77	−0.015	0.020	0.76	0.011	0.014	0.77
Away managerial change	0.117	0.050	2.33	0.046	0.020	2.27	−0.031	0.013	2.40
Wald Chi-Square (32)[a]	259.44 (p value = 0.00)								
LR Chi-Square (1)[b]	38.91 (p value = 0.00)								
Number of observations	3303								

Notes the residuals are clustered at teams pair level.

[a] Statistical test for the whole model specification; [b] LR test of independent equations.

estimation procedures of random effects suffer from numerical stability, convergence and precision problems. For example, Grilli and Rampichini (2003) indicate that the time required for the estimation increases rapidly with the complexity of the model, even when using flexible packages such as GLLAMM. Similarly, we also experienced convergence problems in the estimation of the bi-ordered probit model with random effects, and we decided to show the results for a model with no random effects, but with standard errors corrected for clustering for each pair of home and away teams.

Tables 4 and 5 report the estimated parameters and the marginal impacts of the variables in the model for home and away goals. Results in the table indicate how the different managerial features affect the defensive and offensive skills of the team. When the manager is inexperienced, he has a negative impact on the numbers of goals that the team scores both at home and away. In principle, this is consistent with the view that a less experienced manager will have less ability to stimulate the creative team skills with new tactics, as he has no experience in its implementation. On the other hand, a manager who has been a previous player with the club

Table 5 Bivariate ordered probit regression: (a) estimated parameters and (b) marginal effects on away goals evaluated at averaged values

	(a) Estimated parameters.			*(b) Away team scores two goals or more. Marginal effects.*			*(b) Away team scores no goals. Marginal effects.*		
	Coeff	*Se*	|z|	*dy/dx*	*Se*	|z|	*dy/dx*	*Se*	|z|
Goals received by away team's last home match	−0.014	0.025	0.59	−0.005	0.008	0.59	0.005	0.009	0.59
Goals received by away team's last away match	−0.047	0.025	1.88	−0.016	0.008	1.88	0.017	0.009	1.88
Home team average points in the last ten matches	−0.198	0.040	4.95	−0.068	0.013	4.94	0.072	0.014	4.96
Away team average points in the last ten matches	0.259	0.043	5.96	0.089	0.014	5.97	−0.094	0.015	5.95
Home experience abroad	0.045	0.067	0.68	0.015	0.023	0.67	−0.016	0.023	0.68
Away experience abroad	0.147	0.066	2.20	0.052	0.024	2.15	−0.052	0.023	2.26
Home active	−0.107	0.061	1.74	−0.037	0.022	1.71	0.038	0.021	1.76
Away active	−0.028	0.064	0.45	−0.009	0.022	0.44	0.010	0.022	0.45
Home age	−0.016	0.042	0.40	−0.005	0.014	0.40	0.006	0.015	0.40
(Home age)^2	0.000	0.000	0.39	0.000	0.000	0.39	−0.000	0.000	0.39
Away age	0.006	0.041	0.15	0.002	0.014	0.15	−0.002	0.014	0.15
(Away age)^2	−0.000	0.000	0.34	−0.000	0.000	0.34	0.000	0.000	0.34
Home keeper	−0.214	0.188	1.14	−0.069	0.057	1.22	0.081	0.073	1.11
Away keeper	−0.285	0.213	1.33	−0.090	0.061	1.47	0.109	0.082	1.29
Home defender	−0.098	0.149	0.66	−0.033	0.049	0.67	0.036	0.055	0.65
Away defender	−0.019	0.164	0.12	−0.006	0.056	0.12	0.007	0.060	0.12
Home midfielder	−0.063	0.143	0.44	−0.022	0.049	0.44	0.023	0.051	0.45
Away midfielder	−0.144	0.160	0.90	−0.050	0.055	0.90	0.052	0.057	0.91
Home striker	−0.098	0.167	0.59	−0.033	0.055	0.60	0.036	0.062	0.58
Away striker	−0.046	0.182	0.26	−0.016	0.061	0.26	0.017	0.067	0.26
Home first experience	0.081	0.088	0.91	0.028	0.031	0.90	−0.029	0.031	0.93
Away first experience	−0.196	0.091	2.16	−0.064	0.028	2.28	0.074	0.035	2.11
Home previous team player	−0.108	0.052	2.05	−0.036	0.017	2.08	0.040	0.018	2.03
Away previous team player	0.041	0.050	0.82	0.014	0.017	0.82	−0.014	0.018	0.83
Home Italian	−0.001	0.096	0.02	−0.000	0.033	0.02	0.000	0.037	0.02
Away Italian	−0.078	0.110	0.71	−0.027	0.039	0.69	0.028	0.039	0.72
Home previous player	0.018	0.128	0.14	0.006	0.044	0.14	−0.006	0.046	0.14
Away previous player	0.207	0.145	1.43	0.068	0.045	1.51	−0.078	0.055	1.40
Home previous vice manager	0.117	0.154	0.76	0.041	0.056	0.74	−0.042	0.052	0.78
Away previous vice manager	−0.132	0.148	0.89	−0.044	0.047	0.93	0.049	0.056	0.87
Home managerial change	−0.032	0.052	0.62	−0.011	0.018	0.62	0.011	0.020	0.62
Away managerial change	−0.009	0.051	0.18	−0.003	0.017	0.18	0.003	0.019	0.18
Wald Chi-Square (28)[a]	259.44 (p value = 0.00)								
LR Chi-Square (1)[b]	38.91 (p value = 0.00)								
Number of observations	3303								

Notes the residuals are clustered at teams pair level.

[a] Statistical test for the whole model specification; [b] LR test of independent equations.

significantly improves the defensive skill of the team by conceding fewer goals to his rivals.

Results in this table allow us to discover some effects of managerial features that are masked in an aggregate analysis because it does not distinguish between performances at home and away as well as in defence and attack. For example, experience abroad matters particularly in away matches. It is also worthy of note that none of the position variables is significant relative to the excluded category: non-player. Being active as a manager in the previous year is also insignificant which suggests that it is the whole experience as a manager that matters rather than what he has done in the recent past.

First experience has a negative impact, as expected, that is more important in home matches. These are situations in which the home manager is tested by his own supporters that could be deemed to be more reluctant to accept an inexperience manager.

Finally, although it has been found in the previous section that being an Italian manager does not have any significant effect on match results, the estimation here shows that a home Italian manager significantly reduces the probability of scoring home goals. This is, to our knowledge, the first empirical proof for the stereotype about the defensive orientation of Italian managers.

Table 6 Robustness checks for the effect of a new manager on results

dy/dx	*Symmetric effect at home and away*		*Asymmetric effect at home & away*			
	On home win	*On draw*	*On home win (h)*	*On home win (a)*	*On draw(h)*	*On draw (a)*
(A) No controls	−0.108***	0.022***	−0.12***	0.094***	0.016***	−0.031***
	AIC = 6938.238		AIC = 7375.037		$\chi^2(1) = 0.99$	
(B) Including past results	−0.033**	0.07**	−0.026	0.044**	0.006	−0.011**
	AIC = 6682.109		AIC = 6691.366		$\chi^2(1) = 0.46$	
(C) Including past results and managers features	−0.025*	0.05*	−0.021	0.033	0.005	−0.008
	AIC = 6660.714		AIC = 6682.519		$\chi^2(1) = 0.16$	
–Test (I)	$\chi^2(1) = 24.08$***		$\chi^2(1) = 0.22$			
–Test (II)	$\chi^2(1) = 0.30$		$\chi^2(1) = 0.06$			

Home win/draw random effects ordered probit model.

AIC denotes the Akaike criterion; test (I) represents the test on the coefficients under the null hypothesis that the difference between the coefficients associated with manager turnover in models (C) and (A) is zero; test (II) represents the test on the coefficients under the null hypothesis that the difference between the coefficients associated with manager turnovers in models (C) and (B) is zero. (I) The Symmetric effect does not distinguish between the effect of the new home and away managers while this distinction is considered for the Asymmetric effect case and it is denoted by (h) and (a) respectively. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

One potential problem with the estimations reported in Tables 4 and 5 is the fact that it includes too many covariates and some of them could be spuriously significant by chance. In order to deal with this multiplicity issue suggested by the referee, in an additional experiment we have followed an iterative stepwise procedure in models (5) and (6) dropping in each step the less significant variable until all of them are significant at the 5% level. The estimates of the most significant parameters show similar signs and even a similar magnitude.

Some special attention must be paid to the effect of managerial change on performance. Although it has been shown that a new manager has a non-significant result using the aggregate model in the previous section, this analysis finds that a managerial replacement increases the probability of achieving goals at away matches.

Estimating the impact of a new manager has received great attention in the literature on sports economics (Audas *et al*, 1999, 2002; Tena and Forrest 2007; Flores *et al*, 2012). In their papers, Audas *et al* (1999, 2002) analyse this issue in an ordered probit model for match outcome results, which they use to estimate the causal effect of recent managerial changes represented by a series of dummy variables. These models include information on past results in order to control for mean reversion.

This approach has been followed in more recent articles but including some modifications in the estimation procedures. Although an exhaustive comparison of all the existing literature is out of the scope of this paper, it may be noted that Tena and Forrest (2007) and Flores *et al* (2012) allowed the new manager to have a different impact in home and away matches for the Spanish and the Argentinean league, respectively, and found that this effect is asymmetric and significantly more negative at away matches.

Table 6 compares the effect of a managerial change in the Italian league using an ordered probit specification with different set of variables used as regressors. Namely, the inclusion of past results, to control for a possible mean reverting effect, manager characteristics, to deal with the potential endogeneity problem of coach substitution, different dummy variables for home and away managers to control for the asymmetric effect found in the literature. It can be observed that estimation results are not significantly different under the different econometric specifications once we control for past results what is a common practice in the existing literature. According to these results, we can conclude that, regardless the econometric specification chosen for the analysis, changing a manager has no effect on performance at the 5% significance level.

However, results become sharper once we disaggregate between performance in attack and defence using a bivariate ordered probit model. Table 7 shows the effect of a new manager under different assumptions in this model. It can be seen that the use of this disaggregate analysis allows us to conclude that, regardless of the covariates considered in the econometric specification, the new manager significantly worsens team defensive performance at away matches.

In an additional exercise, we also appraise the relevance of the model specification and managerial variables in a forecasting exercise. In particular, using the sample 2000/2001–2007/2008, we estimate ordered probit models and bivariate ordered probit models, with and without managerial variables that are significant at the 5% level. The different models are evaluated in terms of their ability to forecast home victory, draw and away victory in seasons 2008/2009 and 2009/2010, compared to a naive benchmark specification which, based on the estimation sample, gives probability 0.45, 0.30 and 0.25 to home win, draw and away win, respectively. To do this, we apply the logarithmic scoring rule (LSR) suggested by Bickel (2007). In order to compare the predictive quality of two different forecasting methods, we adapt the Wald-type statistic given by Boero *et al* (2011); see,

Table 7 Robustness checks for the effect of a new manager on results

dy/dx	*Symmetric effect at home and away*				*Asymmetric effect at home and away*			
	g_h_i = 2, g_a_i = .	*g_h_i = 0, g_a_i = .*	*g_h_i = ., g_a_i = 2*	*g_h_i = ., g_a_i = 0*	*g_h_i = 2, g_a_i = .*	*g_h_i = 0, g_a_i = .*	*g_h_i = ., g_a_i = 2*	*g_h_i = ., g_a_i = 0*
(A) No controls	−0.088***	0.064***	0.043***	−0.045***	−0.076***	0.058***	0.032*	−0.033**
					0.101***	−0.068***	−0.053***	0.058***
					HGE: $\chi^2(1) = 1.39$; AGE: $\chi^2(1) = 0.32$			
		AIC = 14,148.81				AIC = 14,150.75		
(B) Including past results	−0.036**	0.026**	0.003	−0.003	−0.021	−0.006	−0.004	0.003
					0.053***	−0.017**	−0.010	0.011
					HGE: $\chi^2(1) = 1.39$; AGE: $\chi^2(1) = 0.32$			
		AIC = 13,894.85				AIC = 13,897.00		
(C) Including past results and managers features	−0.030**	0.022**	−0.004	0.004	−0.016	0.011	−0.011	0.011
					0.046**	−0.032**	−0.004	0.003
					HGE: $\chi^2(1) = 1.32$; AGE: $\chi^2(1) = 0.35$			
		AIC = 13,889.13				AIC = 13,905.18		
–Test (Ia; Ib)		$\chi^2(1) = 12.88$***; $\chi^2(1) = 10.18$***				$\chi^2(1) = 0.06$; $\chi^2(1) = 0.11$		
–Test (IIa; IIb)		$\chi^2(1) = 0.15$; $\chi^2(1) = 0.39$				$\chi^2(1) = 0.00$; $\chi^2(1) = 0.00$		

Home win/draw bivariate ordered probit model for attack and defence.

AIC denotes the Akaike criterion; HGE and AGE stand for home goals equation and away goals equation, respectively; tests (Ia) and (Ib) represent the test on the coefficients under the null hypothesis that the difference between the coefficients associated with manager turnovers in models (C) and (A) is zero for home team goals and away team goals, respectively; tests (IIa) and (IIb) represent the test on the coefficients under the null hypothesis that the difference between the coefficients associated with manager turnovers in models (C) and (B) is zero for home team goals and away team goals, respectively. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively; (a) denotes the Akaike criterion.

Table 8 Logarithmic scoring rules (LSR) and significance tests

	Random effects ordered probit model (1)	*Bivariate ordered probit (2)*	*Test between (1) and (2)*
(A) Past results	1.019	1.024	$\|t\| = 1.12$
(B) Including statistical significative managers features	1.013	1.023	$\|t\| = 0.20$
(C) Including past results and all managers features	1.016	1.017	$\|t\| = 0.08$
(D) Control test	1.066	1.066	
–Test (A–D)	$\|t\| = 2.27$**	$\|t\| = 2.20$**	
–Test (B–D)	$\|t\| = 2.39$**	$\|t\| = 2.17$**	
–Test (C–D)	$\|t\| = 2.06$**	$\|t\| = 2.29$**	
–Test (A–B)	$\|t\| = 0.25$	$\|t\| = 0.71$	
–Test (A–C)	$\|t\| = 0.76$	$\|t\| = 0.18$	
–Test (B–C)	$\|t\| = 1.02$	$\|t\| = 0.85$	

*, **, *** indicate significance at the 10, 5 and 1% levels respectively.

also, Giacomini and White (2006). Table 8 shows the results of this exercise. In this comparison, it should be noted that a general result in econometrics is that adopting a parsimonious models usually leads to a better forecast as the sampling variation in parameter estimates may adversely affect prediction; see, for example, Clements and Hendry (1998). It can be seen that all specifications significantly improve the forecast performance of the benchmark, and, most importantly, more sophisticated models, such as the bivariate ordered probit model with managerial variables, do not forecast significantly worse than much simpler specifications that include only information on past results. This result provides an additional argument for the use of more sophisticated econometric specifications, as they are more informative than their more parsimonious counterparts.

6. Concluding remarks

This paper has analysed the importance for performance of different managerial features. Sports economics offers a fertile ground for this estimation given that the relevant information

used in the analysis is unambiguously defined and can be freely obtained from the media.

We study this issue in the context of Italian football, finding that some managerial features have a significant influence on results even when we account for indicators of team strength and recent results. Variables related to experience turn out to have a significant positive impact on performance. The variable "previous team player" positively influences team results. We also find that cultural values are also important. In particular, being an Italian manager reduces the probability of scoring goals in at home games.

The econometric specification used in the analysis is demonstrated to be useful in order to estimate the impact on results of involuntary managerial change in a model that controls for both past results and managerial features that are correlated with the decision to change a manager. We find that the consideration of different models for performance in attack and defence is relevant to study the impact of a managerial change as the total effect can be masked in the aggregate counterpart.

Acknowledgements—We are very grateful to two anonymous referees for incisive suggestions and to Bruno Atzori for excellent research assistance. J. D. Tena acknowledges financial support from Ministerio de Educación y Ciencia, ECO2009-08100 and ECO2012-32401. Dimitri Paolini gratefully acknowledges financial support by the Ministry of Education, Universities and Research (PRIN), by the Autonomous Region of Sardinia (Legge n. 7), and Fondazione Banco di Sardegna. Claudio Detotto would like to acknowledge the facilities provided by the Faculty of Economics at the University of Guayaquil (Ecuador) and by the Institute of Statistics at the Pontificia Universidad Católica de Valparaíso (Chile).

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Appendix

See Table 9.

Table 9 Correlations between the covariates considered in the ordered probit model

	Home match result	*Home team won its last home match*	*Home team won its last away match*	*Away team won its last home match*	*Away team won its last away match*	*Draw of home team's last home match*	*Draw of home team's last home match*	*Draw of home team's last home match*	*Draw of home team's last home match*	*Home team average points in the last ten matches*	*Away team average points in the last ten matches*	*Experience abroad*
Home match result	1											
Home team won its last home match	0.09	1										
Home team won its last away match	−0.04	−0.08	1									
Away team won its last home match	−0.07	0.01	0.00	1								
Away team won its last away match	0.08	0.00	0.04	−0.05	1							
Draw of home team's last home match	−0.05	−0.59	0.02	0.00	−0.02	1						
Draw of home team's last away match	−0.02	0.01	−0.59	−0.02	−0.02	−0.01	1					
Draw of away team's last home match	−0.01	−0.04	−0.02	−0.36	0.00	0.03	0.02	1				
Draw of away team's last away match	0.02	−0.01	−0.03	−0.02	−0.36	0.00	0.00	0.00	1			
Home team average points in the last ten matches	0.19	0.44	−0.38	0.01	−0.00	−0.15	0.01	0.01	0.00	1		
Away team average points in the last ten matches	−0.22	0.01	−0.01	0.41	−0.03	0.00	−0.00	0.01	−0.16	0.02	1	
Experience abroad	0.11	0.05	−0.03	−0.04	0.04	−0.00	−0.01	−0.01	0.01	0.14	−0.14	1
Active	0.06	0.02	−0.04	−0.03	0.03	0.00	−0.00	0.00	0.02	0.08	−0.07	−0.04
Age	−0.01	0.02	0.01	0.01	−0.02	−0.01	−0.03	−0.01	0.01	−0.01	0.01	0.12
Keeper	−0.00	0.00	0.03	0.03	−0.01	0.01	0.02	0.02	0.02	−0.01	0.02	0.17
Defender	0.00	−0.01	−0.03	−0.00	−0.05	0.01	−0.00	−0.02	0.00	0.00	−0.01	0.14
Midfielder	0.02	0.01	−0.00	−0.02	0.00	−0.01	0.00	−0.00	0.00	0.03	−0.02	−0.11
Striker	0.03	0.03	−0.01	−0.01	0.02	−0.02	−0.00	0.01	−0.00	0.03	−0.05	−0.10
First experience	−0.09	−0.06	0.04	0.05	−0.02	0.03	0.00	−0.00	−0.05	−0.10	0.10	−0.12
Previous team player	0.08	0.03	−0.04	−0.05	0.00	−0.00	0.00	0.00	0.00	0.11	−0.08	0.05
Italian	−0.07	−0.01	0.03	0.04	−0.04	−0.00	0.00	0.01	0.00	−0.09	0.10	−0.34
Previous player	0.09	0.05	−0.03	−0.04	0.01	−0.02	0.00	−0.01	0.04	0.10	−0.10	0.03
Previous vice manager	−0.06	−0.04	0.05	0.04	0.00	0.04	−0.04	0.03	−0.03	−0.07	0.07	0.03
Managerial change	−0.13	−0.07	0.07	0.05	−0.08	0.01	−0.02	0.01	−0.02	−0.22	0.22	−0.04

	Active	*Age*	*Keeper*	*Defender*	*Midfielder*	*Striker*	*First experience*	*Previous team player*	*Italian*	*Previous player*	*Previous vice manager*	*Managerial change*
Home match result												
Home team won its last home match												
Home team won its last away match												
Away team won its last home match												
Away team won its last away match												

Table 9 continued

	Active	*Age*	*Keeper*	*Defender*	*Midfielder*	*Striker*	*First experience*	*Previous team player*	*Italian*	*Previous player*	*Previous vice manager*	*Managerial change*
Draw of home team's last home match												
Draw of home team's last away match												
Draw of away team's last home match												
Draw of away team's last away match												
Home team average points in the last ten matches												
Away team average points in the last ten matches												
Experience abroad												
Active	1											
Age	0.07	1										
Keeper	−0.26	0.04	1									
Defender	0.00	0.16	−0.09	1								
Midfielder	0.14	−0.09	−0.18	−0.61	1							
Striker	0.01	−0.19	−0.04	−0.31	−0.31	1						
First experience	−0.24	−0.28	0.01	0.07	−0.03	0.06	1					
Previous team player	−0.03	−0.05	−0.08	−0.06	0.17	0.06	0.21	1				
Italian	0.07	0.11	0.05	−0.28	0.19	0.04	−0.13	0.03	1			
Previous player	0.07	−0.02	0.05	0.20	0.32	0.10	0.10	0.21	−0.02	1		
Previous vice manager	−0.34	−0.05	0.29	−0.01	−0.11	0.08	0.24	0.09	0.05	0.01	1	
Managerial change	−0.21	0.12	0.06	0.00	−0.12	0.00	0.05	−0.04	0.04	−0.13	0.12	1

Received 28 May 2014; accepted 6 March 2017